

Reagent-Free Compact Online TOC Sensor, Phase I

Completed Technology Project (2009 - 2009)



Project Introduction

One of the highest priorities in Environmental Control and Life Support (ECLS) for longer missions is to recover and process wastewater to provide clean water. There is an important need for a total organic carbon (TOC) sensor to assure that the organic chemical content of water environment of the astronaut crew habitat falls within acceptable limits, and that the chemical life support system is functioning properly. For longer missions, water monitoring requires sensitive, fast response, online analytical sensors. Lynntech has successfully developed a novel regenerative TOC analyzer for real-time monitoring of water quality with an operational lifetime of 5 years with no maintenance required and no need to supply reagents. In addition, the TOC analyzer was flight-qualifiable and microgravity-compatible. This proposal concerns further development of the TOC analyzer as a compact online analytical sensor utilizing (i) electrochemical components producing two key elements in TOC analysis, acid and oxidant; (ii) photolysis/photocatalysis for the complete oxidation of organic carbons to carbon dioxide; and (iii) mesofluidic design. During the Phase I effort, the feasibility of the proposed system and approach will be demonstrated. A prototype will be designed, fabricated, tested, and delivered to NASA during the Phase II project.

Anticipated Benefits

Total organic carbon (TOC) analysis is a well-defined and commonly used analytical tool. Many water utilities monitor TOC to determine raw water quality or to evaluate the effectiveness of processes designed to remove organic carbons. Successful development of a compact online total organic carbon analyzer (TOCA) as a hand-held device will have a high commercial applicability to a wide range of industries where water quality assurance and control is important, such as semiconductor industries or pharmaceutical industries.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission
Directorate (STMD)

Lead Center / Facility:

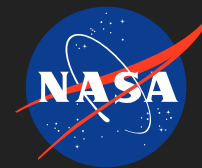
Jet Propulsion Laboratory (JPL)

Responsible Program:

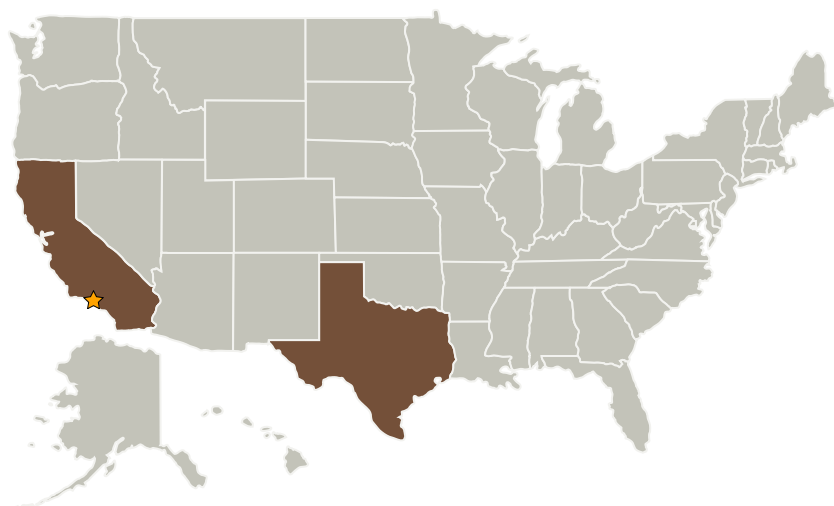
Small Business Innovation
Research/Small Business Tech
Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California
Lynntech, Inc.	Supporting Organization	Industry	College Station, Texas

Primary U.S. Work Locations

California	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

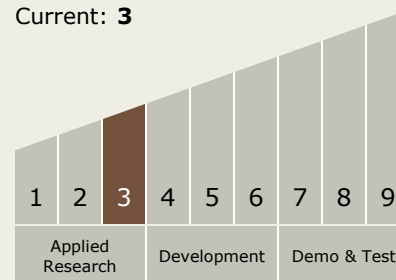
Celestino Jun Rosca

Principal Investigator:

Jinseong Kim

Technology Maturity (TRL)

Start: 3
Current: 3



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.4 Environmental Monitoring, Safety, and Emergency Response
 - └ TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic